PROC. BIOL. SOC. WASH.
107(4), 1994, pp. 729–737

TWO NEW SPECIES AND ONE NEW COMBINATION OF FRESHWATER CRABS FROM MEXICO (CRUSTACEA: BRACHYURA: PSEUDOTHELPHUSIDAE)

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Abstract.—*Pseudothelphusa guerreroensis* Rathbun, 1933, is referred to the genus *Tehuana* Rodríguez & Smalley, 1969, based on the morphology of the first gonopod, with a lobular marginal process partially fused to the mesial process, and the presence of a distinct superior frontal border of the carapace, both traits characteristic of *Tehuana.* Two new species, *Tehuana lamothei* and *Pseudothelphusa nayaritae,* are described from the Mexican States of Chiapas and Nayarit, respectively. *Tehuana lamothei* was collected 230 km southeast of the present southernmost limit of the genus. *Tehuana lamothei* is recognized by a gonopod with the most reduced mesial process of all of the species in the genus. *Pseudothelphusa nayaritae* belongs to a group of species from western Mexico which lacks a marginal process on the first gonopod.

Two specimens of *Pseudothelphusa guerreroensis* Rathbun, 1933, deposited in the Crustacean Collection, Instituto de Biología, Universidad Nacional Autónoma de México (IBUNAM EM-358), were compared with *Tehuana lamothei,* new species, described in this study. It was judged that the specimens of *P. guerreroensis* should be placed in the genus *Tehuana* Rodríguez & Smalley, 1969. Two key characters separate *Tehuana* from *Pseudothelphusa* de Saussure, 1857: the form of the marginal process of the gonopod, which is rounded and partially fused to the mesial process in the former, and absent or dentiform and completely fused to the mesial process in the latter; and the presence in *Tehuana,* and absence in *Pseudothelphusa,* of a defined superior frontal border of the carapace.

Tehuana lamothei, new species, is described from the mountains of northern Chiapas above 1000 m of altitude. The present work adds a sixth genus (*Tehuana*) to the pseudothelphusid crab fauna of Chiapas. The six genera, *Raddaus* Pretzmann, 1965; *Potamocarcinus* Milne Edwards, 1853; *Typhlopseudothelphusa* Rioja, 1952; *Odontothelphusa* Rodríguez, 1982; *Epithelphusa* Rodríguez & Smalley, 1969; and *Tehuana* Rodríguez & Smalley, 1969, are classified in three different tribes (Hypolobocerini, Potamocarcinini, and Pseudothelphusini). This high diversity is, in part, a reflection of the large number of rivers and the abrupt geography of this region. *Pseudothelphusa nayaritae,* new species, from the Mexican State of Nayarit, represents a modified form within the genus based on its gonopod morphology, since it has lost the characteristic marginal process. The absence of the marginal process is a character shared by five other species of *Pseudothelphusa* found in the western portion of the distribution of the genus. The presumed development of the marginal process (Rodríguez & Smalley, 1969) shows a sequence in which this process, starting from a caudal position (e.g., *Potamocarcinus*), first reaches the apex of the gonopod (e.g., *Spirothelphusa* Pretzmann, 1965), and then becomes recurved over the mesial crest as a conspicuous lobe (e.g., *Tehuana* and *Pseudothelphusa*). All the specimens discussed here are deposited in the Crustacean Col-

lection, Instituto de Biología, Universidad Nacional Autónoma de México (IBUNAM). The gonopod terminology used is that proposed by Smalley (1964) and Smalley & Adkison (1984). Carapace width and carapace length are abbreviated as cw and cl; catalog numbers are preceded by the letters EM which denote an access code.

Tehuana Rodríguez & Smalley, 1969

Remarks.—The genus *Tehuana* was created to separate a subgroup of species of *Pseudothelphusa* with gonopods that exhibit a distinctly rounded marginal process only partially fused to the mesial process and a well marked superior frontal border of the carapace. The species are distributed west of the Isthmus of Tehuantepec (Rodríguez & Smalley 1969). The five species of *Tehuana* (*T. lamellifrons* Rathbun, 1893; *T. complanata* Rathbun, 1905; *T. veracruzana* Rodríguez & Smalley, 1969; *T. poglayenorum* Pretzmann, 1980; and *T. diabolis* Pretzmann, 1980) exhibit a progressive increase in size of the mesial process of the gonopod on a westward direction from Los Tuxtlas region, in the State of Veracruz.

Tehuana guerreroensis (Rathbun, 1933), new combination
Figs. 1, 4a–b

Pseudothelphusa guerreroensis Rathbun, 1933:360.—Pretzmann, 1965:10.—Smalley, 1970:105.

Pseudothelphusa (*Pseudothelphusa*) *guerreroensis* Rodríguez & Smalley, 1969:79, fig. 11, pl. 7.—Pretzmann, 1971: 22.—Pretzmann, 1972:104, figs. 640–642.

Pseudothelphusa guerreroensis Rodríguez, 1982:135, fig. 87.

Material examined.—1 male, cw 38.0 mm, cl 24.5 mm; Copanatoyac, Guerrero (17°27′N, 98°35′W), 26 Oct 1963, coll. M. Rosas; IBUNAM EM-358. 1 female, cw 55.3 mm, cl 35.0 mm; same locality, date, and collector as holotype; IBUNAM EM-358a.

Description.—Carapace slightly convex, surface smooth. Superior frontal border marked by irregular blunt tubercles. Front smooth, divided by median groove, slightly bilobed in dorsal view (Fig. 4a). Inferior frontal border prominent, composed of blunt tubercles, continuous with superior border of orbits. Median groove narrow and deep, dividing superior frontal border and front. Postfrontal lobes elevated, limited anteriorly by distinct groove. Cervical grooves arched, deep, wide, not reaching anterolateral margin. Gastric and branchial regions elevated. Branchial region divided by shallow depression. Anterolateral margin continuous, formed by blunt, irregular denticles. Ischium of third maxilliped trapezoidal, distal part wider than proximal part (Fig. 1d). Merus of third maxilliped broad, with external margin rounded, becoming straight distally; inner margin straight, with portion at base of carpus slightly arched. Ratio exopod/ischium of third maxilliped 0.71. Right chela missing. Left chela slender, surface smooth, with distinct large rounded tubercle at base of fixed finger (Figs. 1e, 4b). Fingers not gaping.

Gonopod curved in lateral view, straight in cephalic and caudal views (Fig. 1b, c). Apex with lateral process oval-shaped, with sharp triangular tooth oriented caudally (Fig. 1a). In lateral view, marginal and mesial processes oriented proximally. Mesial process reniform. In cephalic view, apex cavity exposed, terminal pore setae visible; marginal and mesial processes curved mesially. In caudal view, lateral and mesial crests of apex of same height, marginal and mesial processes completely separated, lateral process with large triangular tooth in central section.

Remarks.—The holotype of this species is a female deposited in the Berlin Zoology Museum. The type locality was reported erroneously in the original description by Rathbun (1933) to be "Malinaltepec, south of Teopa, Guerrero." The correct type locality is "Malinaltepec, south of Tlapa,

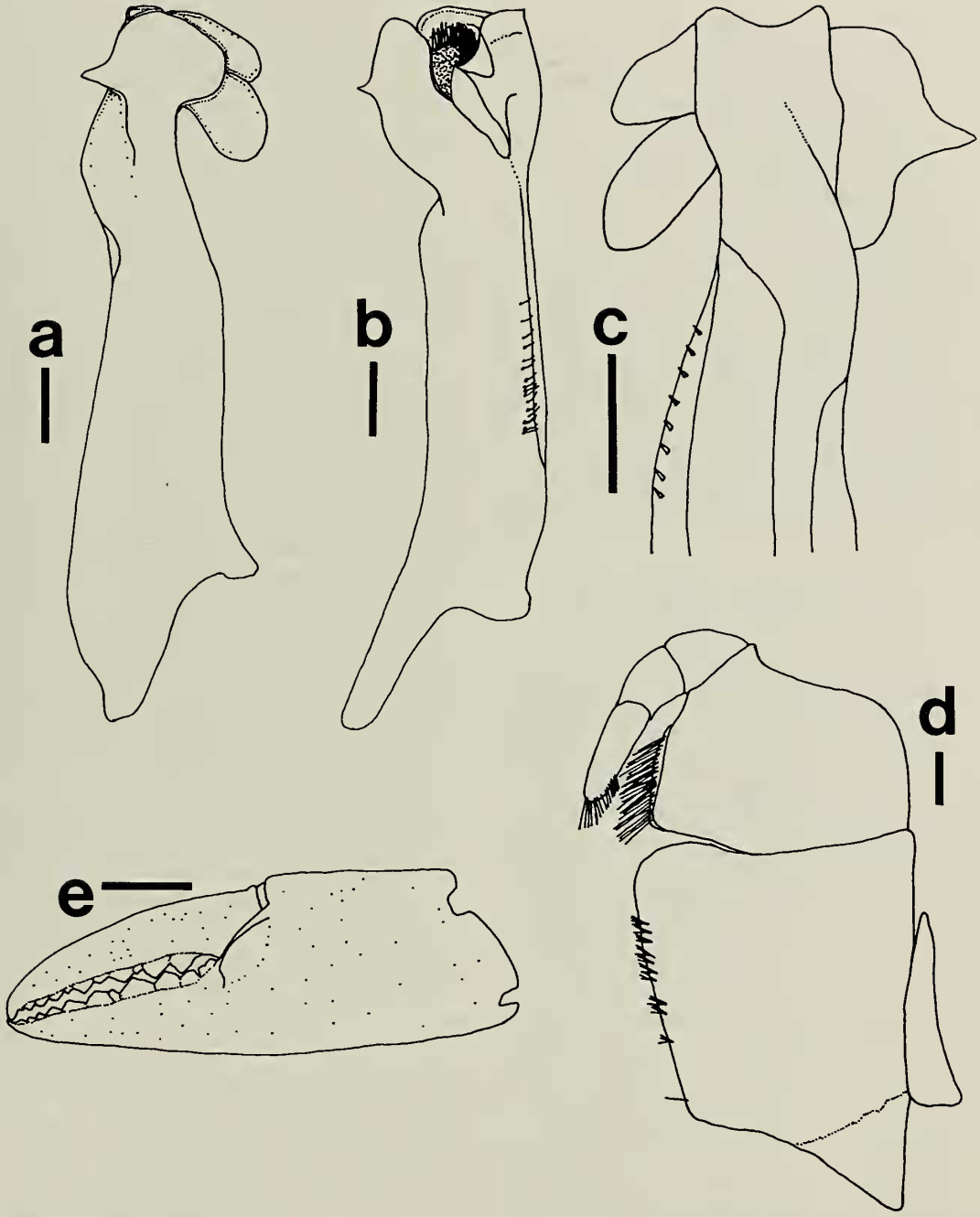

Fig. 1. *Tehuana guerreroensis,* new combination, a–c left gonopod: a, lateral view; b, cephalic view; c, caudal view; d, third maxilliped; e, left chela. Scale bars: a–d = 1 mm, e = 5 mm.

Guerrero," and cannot be located precisely since "Malinaltepec" is the name of a small mountain range, not of a town. Rodríguez & Smalley (1969) described the first male of the species from "Copanatoyac, 40 km southwest from the type locality," and also wrongly reported the type locality as "Malinaltepec south of Teapa, Guerrero." In spite of the fact that the male described by Rodríguez & Smalley (1969), and redescribed in this paper, cannot be a type specimen, its description has become the only reference to identify the species. We propose the assignment of *Pseudothelphusa guerreroensis* to the genus *Tehuana,* based on the presence of a distinct superior frontal border of the carapace and on the partially fused marginal and mesial processes in the male gonopod.

Tehuana lamothei, new species
Figs. 2, 4c

Holotype.—Male, cw 27.3 mm, cl 18.2 mm; Arroyo La Piedra, 1 km from Ixtacomitán, Chiapas (17°25'N, 93°05'W), 4 Apr 1986, colls. J. C. Nates, A. Cantú, D. Valle, and E. Lira; IBUNAM EM-5604.

Material examined.—2 males designated as paratypes, cw 33.7, 32.0 mm, cl 21.5, 20.8 mm; Tapilula, Chiapas (17°15'N, 93°01'W), 20 Apr 1981, coll. R. Lamothe, IBUNAM EM-8812. 4 males, cw 22.9, 22.5, 21.0, 17.3 mm, cl 15.4, 15.0, 14.0, 11.9 mm; 1 female, cw 34.8 mm, cl 22.2 mm; same locality and collectors as holotype; IBUNAM EM-5604a. 2 males, cw 37.4, 13.7 mm, cl 23.9, 9.2 mm; 1 female, cw 49.7 mm, cl 31.6 mm; same locality and collectors as paratypes; IBUNAM EM-8812a.

Description.—Dorsal surface of carapace slightly convex, smooth, covered with fine punctations. Superior frontal border straight, prominent, formed by small tubercles, divided by deep median notch, disappearing laterally behind orbit. In frontal view, inferior frontal border continuous, sinuous, thinner than superior one (Fig. 4c). Median groove narrow between postfrontal lobes; in dorsal view, deep and wide forming V-shaped notch in front. Postfrontal lobes limited anteriorly by shallow depressions. Cardiac region discernible. Cervical grooves deep, strongly curved, reaching anterolateral margin producing small notch. Anterolateral margin with 21–23 small denticles between cervical groove and epibranchial region. Merus of third maxilliped with distolateral margin rounded, distal and inner margins straight (Fig. 2e). Ratio exopod/ischium of third maxilliped 0.75. Major chela right, inner surface globose, fingers not gaping, and curved inwards distally (Fig. 2f). Propodus of fifth walking leg with distinct ridge bearing spines on ventral margin.

Gonopod curved in cephalic, lateral, and caudal views, straight in cephalic view (Figs. 2a–d). Apex bearing three distinct lobes or processes. In cephalic view, lateral process with superior margin describing a semicircle, with sharp triangular tooth oriented caudally, and small rounded tooth on cephalic margin. In lateral view, lateral process oriented caudally, marginal and mesial processes oriented anteriorly at 90° angle with respect to longitudinal axis of gonopod. Mesial process broadly rounded, partially fused to marginal process. Small blunt projection on mesial surface close to mesial crest, visible in cephalic and caudal views. Lateral crest of apex cavity rounded, higher than mesial crest. Field of terminal pore setae elongated on lateral portion of apical cavity.

Etymology.—This species is named after our colleague Rafael Lamothe, from Instituto de Biología at UNAM.

Remarks.—*Tehuana lamothei* exhibits the key characters that distinguish *Tehuana* from *Pseudothelphusa,* namely: the conspicuous superior border of the carapace and the gonopod's broadly rounded mesial process, partially fused to the also rounded marginal process. Relative to the other species of the genus, the gonopod morphology places *T. lamothei* at one end of the range of variation: it possesses the most reduced

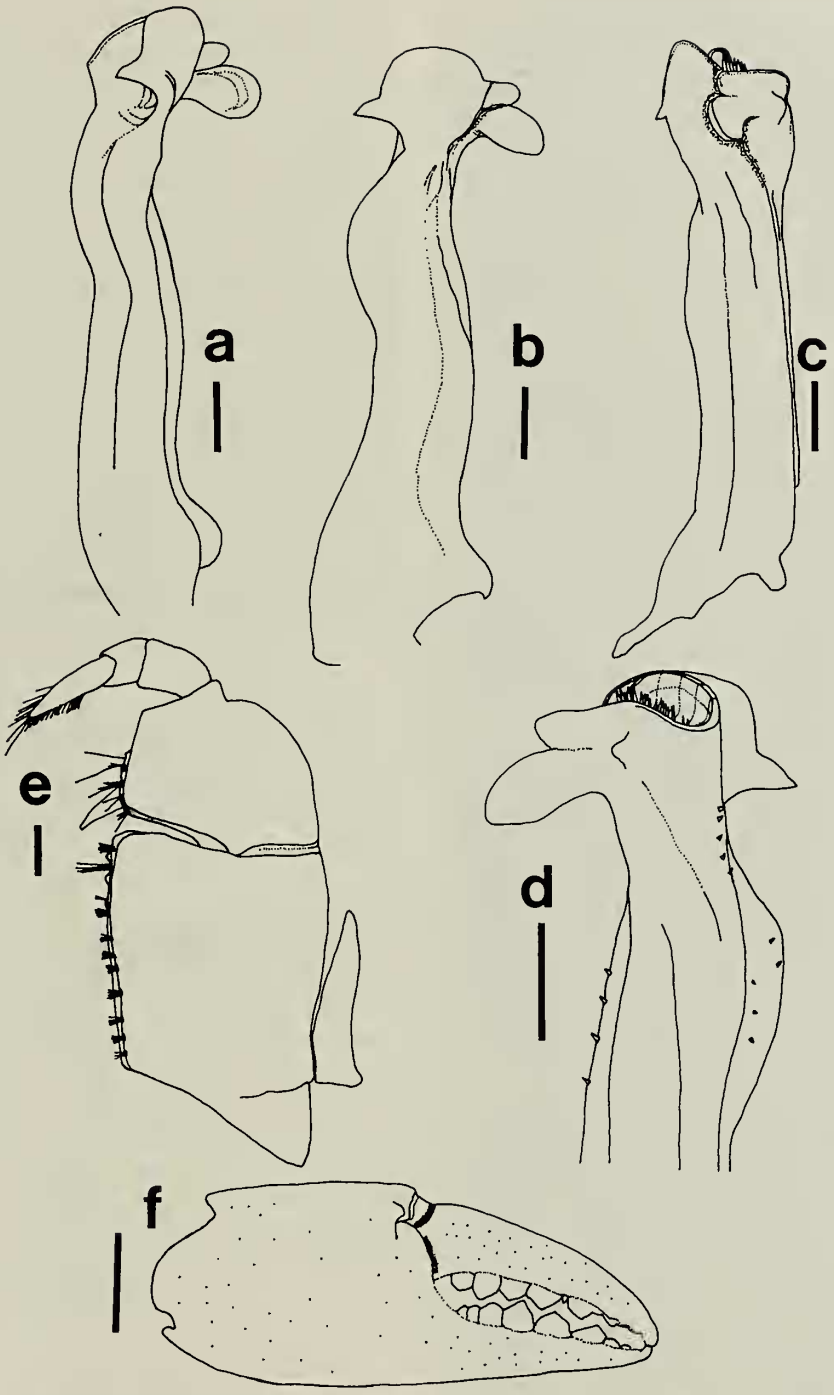

Fig. 2. *Tehuana lamothei,* new species, a–d left gonopod: a, lateral view; b, laterocephalic view; c, cephalic view; d, caudal view; e, third maxilliped; f, right chela. Scale bars: a–e = 1 mm, f = 5 mm.

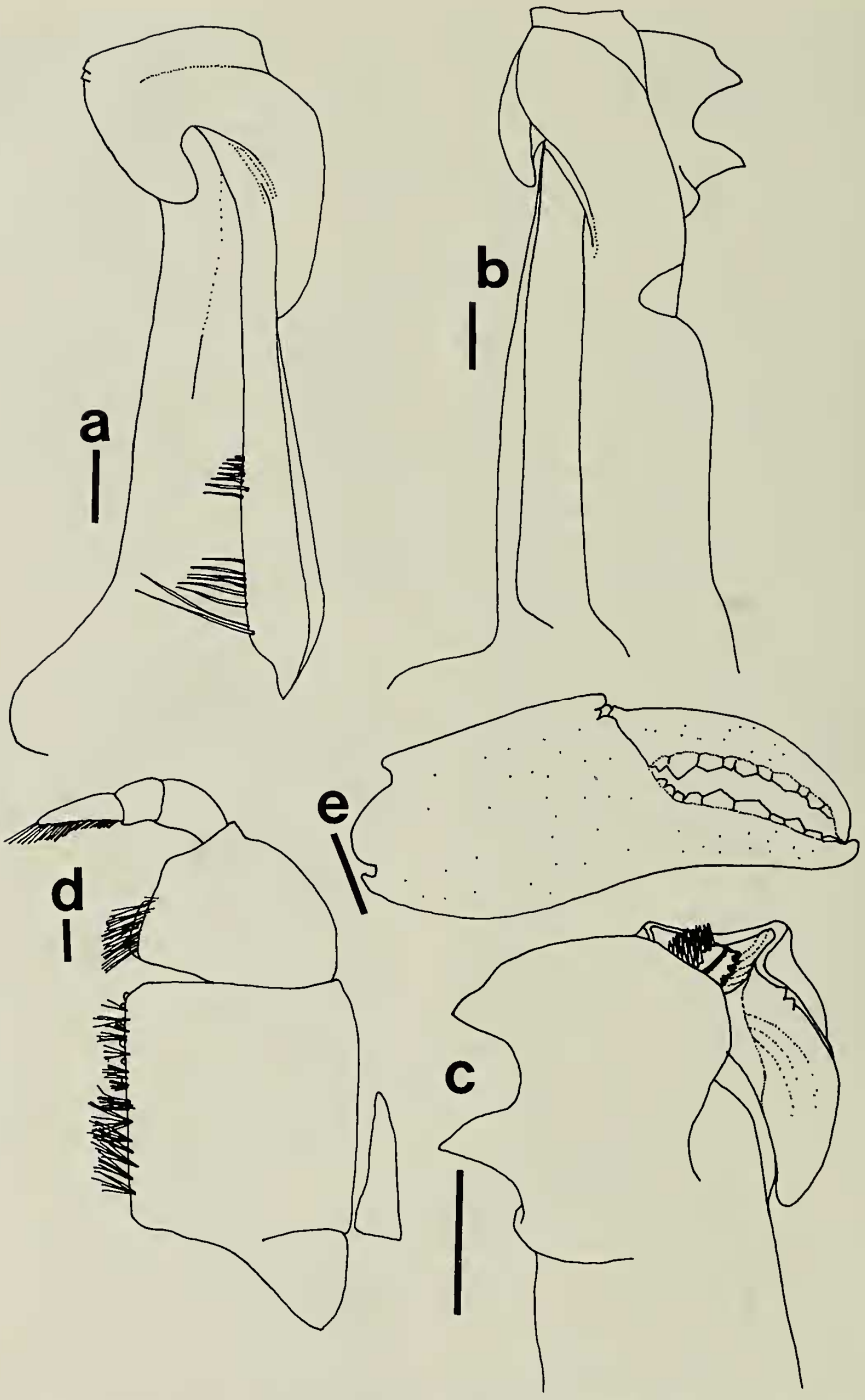

Fig. 3. *Pseudothelphusa nayaritae,* new species, a–c left gonopod: a, mesial view; b, caudal view; c, cephalic view; d, third maxilliped; e, right chela. Scale bars: a–d = 1 mm, e = 5 mm.

mesial process, that forms a 90° angle with respect to the longitudinal axis (i.e., oriented anteriorly); and its lateral process is the largest within the genus. In the other five species of *Tehuana,* the mesial process progressively increases in size, is oriented proximally, and the lateral process becomes very reduced. This sequence of gradual morphological change, which has been described for other pseudothelphusid crabs (Alvarez 1989; Alvarez & Villalobos 1991; Rodríguez 1982, 1987), also coincides in species of *Tehuana* with their geographical distribution. *Tehuana lamothei,* at one end of the spectrum, marks the southeastern limit of the range of the genus; *T. poglayenorum* and *T. diabolis,* with their intermediate morphology, occur in the central portion of the range; and *T. veracruzana* and *T. complanata,* occurring to the west, have the most enlarged mesial process.

Pseudothelphusa de Saussure, 1857

Remarks.—The genus *Pseudothelphusa* is distributed in Mexico from the 18°N parallel northwards, from the Gulf of Mexico, in Los Tuxtlas, Veracruz, across central Mexico to the Pacific slope. *Pseudothelphusa* is distinguished from the closely related *Tehuana* based on the marginal process of the gonopod which is completely fused to the mesial process, and in many species it appears as a sharp tooth (e.g., *P. parabelliana,* Alvarez, 1989). The marginal process can be reduced to a series of small denticles (e.g., *P. jouyi,* Rathbun, 1893) or be completely absent (e.g., *P. galloi,* Alvarez & Villalobos, 1990). The superior frontal border of the carapace is absent in most of the species of *Pseudothelphusa.*

Pseudothelphusa nayaritae, new species
Figs. 3, 4d

Holotype.—Male, cw 40.3 mm, cl 23.1 mm; Arroyo El Guayabito, Mecatán, Nayarit (21°30'N, 105°10'W), 5 Apr 1984, coll. R. Lamothe; IBUNAM EM-8820.

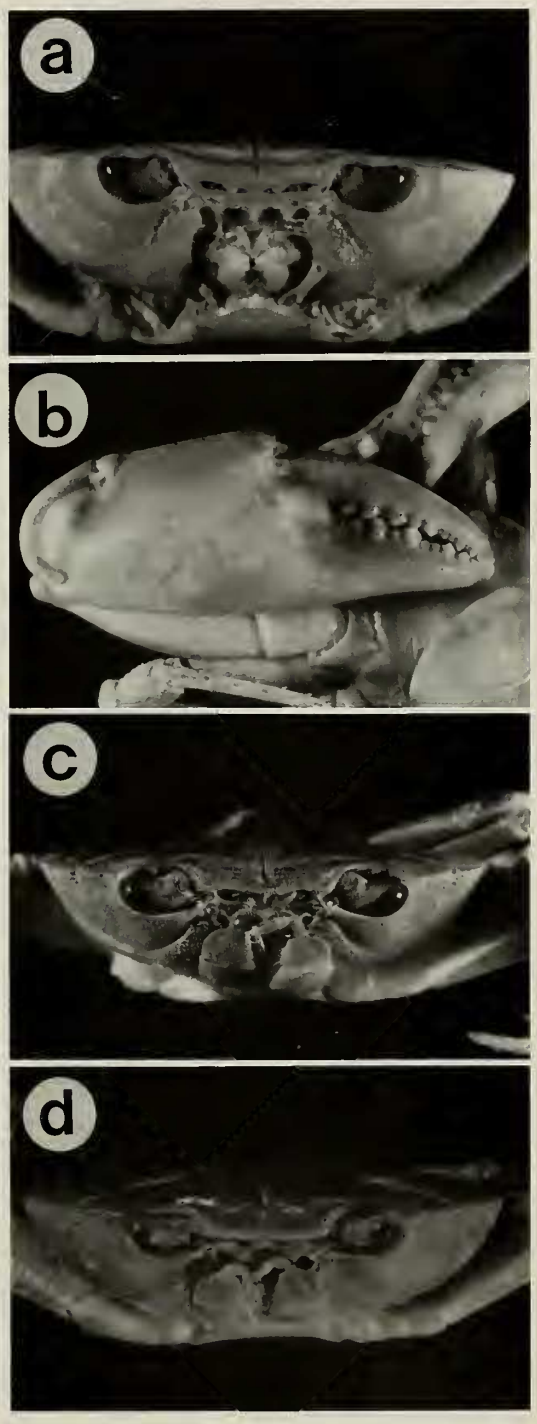

Fig. 4. *Tehuana guerreroensis,* new combination: a, front of carapace; b, right chela (cw 38.0 mm). *Tehuana lamothei,* new species: c, front of male holotype (cw 27.3 mm). *Pseudothelphusa nayaritae,* new species: d, front of male holotype (cw 40.3 mm).

Material examined.—1 female, cw 42.6 mm, cl 25.4 mm; same locality, date, and collector as holotype; IBUNAM EM-8820a.

Description.—Dorsal surface of carapace convex, smooth, covered with small papillae. Superior frontal border absent; front limited by a folding of the carapace. Inferior frontal border smooth, straight in frontal view; slightly biconvex in dorsal view, continuous with orbits (Fig. 4d). Region between front and postfrontal lobes sloping markedly towards front. Postfrontal lobes discernible. Median groove slightly marked between postfrontal lobes. Cervical grooves deep, straight anteriorly, curved towards gastric region posteriorly, not reaching anterolateral margin. Cardiac region indicated by conspicuous depressions. Posterior margin of carapace markedly biconvex in dorsal view. Anterolateral margins smooth, devoid of denticles. Ratio of exopod/ischium of third maxilliped 0.58. Major chela right, surface of palm smooth, fingers gaping and curving inwards distally (Fig. 3e).

Gonopod thick, strong. In mesial view (Fig. 3a), mesial process reniform, recurved proximally; marginal process reduced to 2 small triangular teeth situated on superior cephalic angle of mesial process. In cephalic view (Fig. 3b), gonopod decreasing in thickness distally; apex of gonopod with broad lateral process, rounded superior margin, laterally bearing 2 sharp triangular projections, forming wide U-shaped notch. In caudal view (Fig. 3c), sperm channel constricted at ⅔ of its length, curved mesially; sharp projections of lateral and mesial processes visible. Apex cavity elongated along a caudocephalic axis, mesial crest higher than lateral one, and field of terminal pore setae restricted to lateral portion of cavity.

Etymology.—The species name makes reference to the State of Nayarit, where the species was collected.

Remarks.—The description of *P. nayaritae* brings the number of species of *Pseudothelphusa* to 21, including *P. puntarenas* (Hobbs 1991) from Costa Rica, which is assigned to the genus *Pseudothelphusa* with caution due to its distribution and gonopod morphology. *Pseudothelphusa nayaritae* shares with *P. galloi, P. jouyi, P. lophophallus* Rodríguez & Smalley, 1969, *P. rechingeri* Pretzmann, 1965, and *P. sonorae* Rodríguez & Smalley, 1969, all distributed in western Mexico, the complete reduction of the marginal process of the gonopod. The vestiges of the marginal process are apparent only in *P. jouyi, P. lophophallus,* and *P. nayaritae,* in the form of a series of small teeth located on the superior cephalic angle of the mesial process of the gonopod. The lateral process of the gonopod in *P. nayaritae* is reminiscent of that of the *P. dilatata* Rathbun, 1898, species complex in central Mexico (Rodríguez 1982). *Pseudothelphusa nayaritae, P. peyotensis* (Rodríguez & Smalley 1969) and *P. leiophrys* (Rodríguez & Smalley 1969), are all found in the State of Nayarit. *Pseudothelphusa leiophrys* was originally described from the State of Colima (Rodríguez & Smalley 1969), and was recently collected in Nayarit, from El Durazno, 2 km north from Los Sabinos (IBUNAM EM-12294).

Acknowledgments

We would like to thank Dr. Rafael Lamothe for donating most of the specimens included in this study and A. Cantú, E. Lira, D. Valle, and J. C. Nates, for their help in the field.

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